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## ON CERTAIN OPTICAL PHENOMENA.

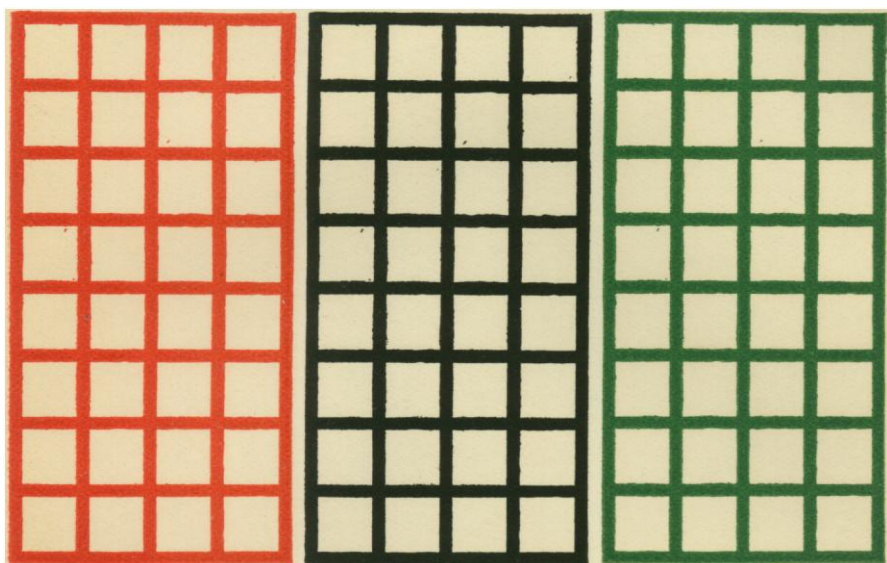
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Some years ago, Prof. H. H. Donaldson gave to the Clark laboratory four large diagrams showing peculiar optical phenomena, but without giving at the same time any definite account of their origin and purpose. All, however, bore the legend "W. Preyer, *del.*," or its equivalent, and after fruitless examination of accessible list of Prof. Preyer's writings, I applied to him directly for references to literature containing explanations of them. In reply I received the following courteous letter. Availing myself of the permission given in the last sentence I publish the letter here with reproductions of the plates described. The reproductions have been made on half the scale of the originals; and in the case of the last, a wide black border has been made narrow. Otherwise the reproductions are fairly exact.

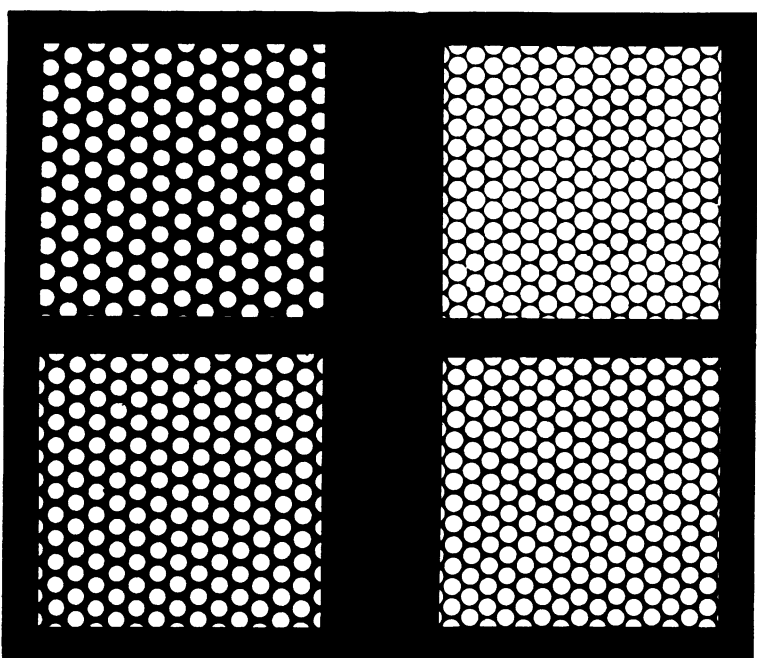
E. C. S.

*To Professor E. C. Sanford, Clark University, Worcester :*

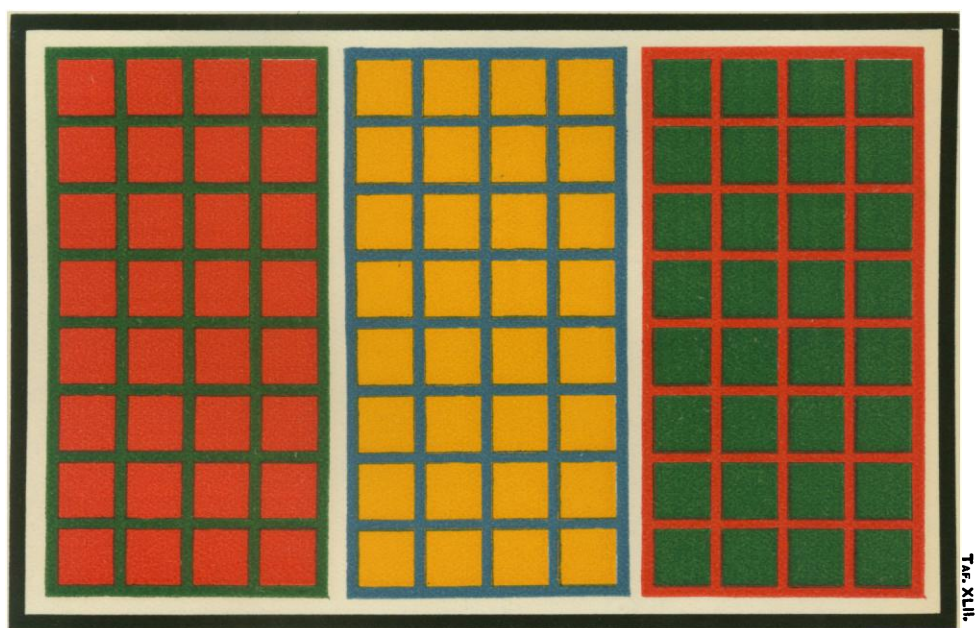
In reply to your kind letter, dear sir, I am glad I can furnish you with some particulars about the four plates. They are not taken from some work on color and optical illusions, but belong to a collection of plates which I intended to publish in the form of an atlas, so as to enable professors of physiology and students to study certain important phenomena of which I had spoken in my lectures at the University of Jena, and partly at Berlin—phenomena not mentioned or not explained, or not correctly explained in the text-books. This work never has been completed, because the publisher got into insurmountable pecuniary difficulties and failed. I therefore presented the copies, as far as they were finished and printed, to my hearers, explaining the meaning of every detail verbally. Only two plates, which do not seem to be in possession of your laboratory, but have a very peculiar psychological interest, are accompanied by a printed explanation, published in the *Jenaische Zeitschrift für Naturwissenschaft*. Perhaps I may find a copy which I can send to you.



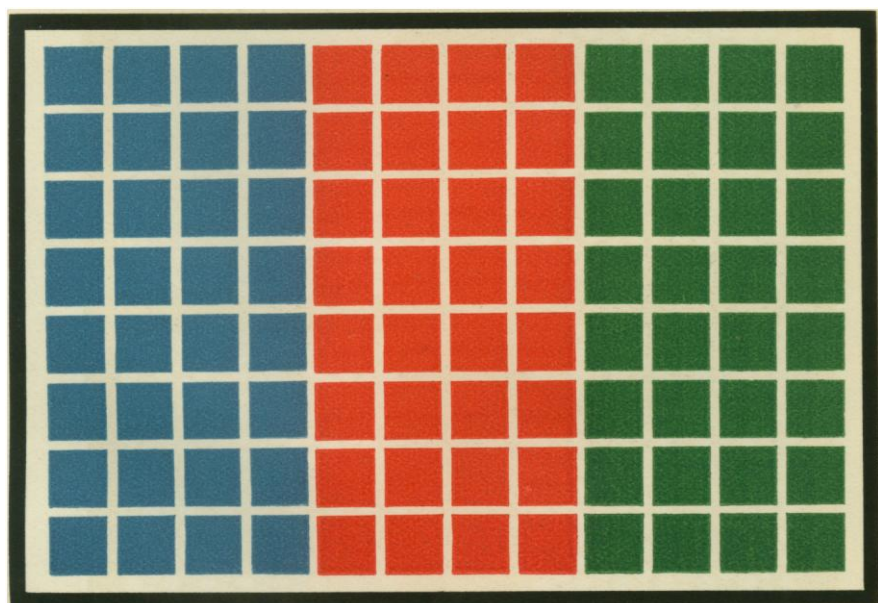
Taf. XII.



Taf. XIII



Taf. XLII.



Taf. XLIII.

The first plate you mention I designed immediately after I had found out that the knobs of *Pleurosigma angulatum*, the test-object for microscopes, are not hexagonal, but circular. This is a matter of accommodation. Attach the paper to the wall of your room vertically about the height of your eyes above the floor and approach it slowly and rectilinearly from the opposite wall until you very distinctly see the circles in one of the squares to be really circles (it will be the square wherein the separating black is of the maximum width), then, at least, two of the remaining three squares will appear to contain hexagons. A man, even endowed with superior faculties, might swear that one square contains only hexagons and another only circles, while all of them are seen under exactly the same conditions in the same broad daylight. So the fallacy of our judgment of forms, as soon as we come near the limit of our accommodation-power, is proved plainly.

Besides, this plate shows sometimes (I know not the *conditio sine qua non*) a new phenomenon of simultaneous contrast, namely, in the centre of the white disks with the broadest separating black ground, you will see a roundish gray spot, not sharply separated from the white ground.

The second plate you mention (probably marked "Taff. XLI") illustrates a similar fact. You see white or grayish white spots at every one of the intersections of the green, black or red bars. These dots, though not sharply defined, look more like squares than like circles. So it is proved that this optical illusion is independent of color, but not of form—I mean the configuration of the "inducing field" (*e. g.*, circle or square) alters the shape of the "induced." The production of the latter is easier if the accommodation apparatus is at rest, than otherwise. Besides, the phenomenon is all the more surprising (stunning to some individuals), when the difference of intensity between the bars and the squares is a maximum.

Your third plate, with the colored "inducing fields," shows the induced dots always of the same color.

The fourth plate you mention confirms this law even for complementary colors.

Sometimes you will see in the last mentioned three plates quite straight but not sharply defined lines, exactly equidistant from two neighboring squares, and ending in the dots. Their color invariably is the same as the color of the dots.

You will very likely find yourself some additional facts by varying the conditions, *e. g.*, taking colored eye-glasses, reposing the eyes in the dark for fifteen minutes, illuminating the plates by the electric spark, staring at the bars in order to get the after-image (*Nachbild*), which has no dots. But it

would be too lengthy to describe all this. I leave the whole subject to you. I shall be much pleased if you and other gentlemen find the statements in this letter to be correct, and some day will be able so explain the facts. The current theory of simultaneous contrast is quite insufficient, and Hering's hypothesis only partly agrees with my observations. So the field for new researches seems to me to be promising. Not being so fortunate as to find the connecting link of all the strange subjective phenomena, I dropped the subject long ago, and now hope that you may be more successful.

You are quite at liberty to make any use of this letter you may think proper.

Believe me, dear sir,

Yours truly,

Nov. 1, 1896,

Prof. Dr. W. PREYER.

Wiesbaden, Villa Panorama.